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PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-199598
 (43)Date of publication of application : 06.08.1993

(51)Int. Cl.

H04S 5/02
 H04R 3/12
 H04S 1/00

(21)Application number : 04-008975
 (22)Date of filing : 22.01.1992

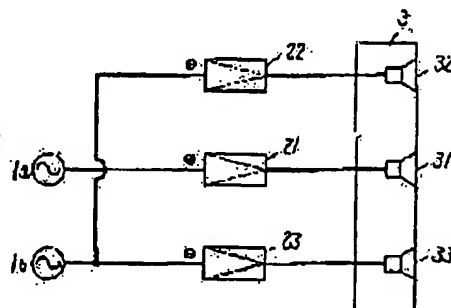
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(54) SOUND REPRODUCING SYSTEM

(57)Abstract:

PURPOSE: To provide the sound reproducing system which displays a satisfactory surround effect only by arranging a speaker system, where plural speakers are arranged in a line, in the front.

CONSTITUTION: A first signal drives plural speakers 31 to 33, which are arranged in a line, with the same phase, and a second signal drives speaker units 32 and 33, which are placed symmetrically with respect to the center of the speaker array, with opposite phases, and signals whose amplitudes and phases are most suitably controlled are applied to respective speakers 31 to 33, thereby obtaining an objective directional pattern. Thus, the system with transmits direct sounds to a listener in the front of speakers 31 to 33 in the case of a main signal and transmits indirect sounds from walls, the floor, and the ceiling to him in the case of a subsignal is provided, and the satisfactory surround system is obtained without using side speakers neither rear speakers.



LEGAL STATUS

[Date of request for examination] 07.01.1997
 [Date of sending the examiner's decision of rejection]
 [Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
 [Date of final disposal for application]
 [Patent number] 2827652
 [Date of registration] 18.09.1998
 [Number of appeal against examiner's decision of rejection]
 [Date of requesting appeal against examiner's decision of rejection]
 [Date of extinction of right]

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CLAIMS

[Claim(s)]

[Claim 1] The sound-reproduction system characterized by driving the above 1st and the 2nd signal simultaneously while inputting the 2nd signal into the loudspeaker of the periphery which is in a symmetric position to a loudspeaker train medial axis about the 1st signal at the loudspeaker of a center section in the loudspeaker system which has arranged two or more loudspeakers in the shape of a line by the antiphase mutually.

[Claim 2] It is the sound-reproduction system characterized by for the 1st signal to have been in phase and to have inputted into each mixing circuit, to have inputted the 2nd signal into each mixing circuit so that it might become the loudspeaker which is in a symmetric position to the center of the aforementioned loudspeaker train with an antiphase mutually, to have amplified the output of the aforementioned mixing circuit, and to drive each loudspeaker in the loudspeaker system which has arranged two or more loudspeakers in the shape of a line while preparing the mixing circuit to each loudspeaker.

[Claim 3] The sound-reproduction system according to claim 2 characterized by adjusting the driver voltage of each loudspeaker, or the efficiency of each loudspeaker so that the output sound pressure to the 1st signal may be large in the loudspeaker of a center section and may become small by the loudspeaker of a periphery in the loudspeaker system which has arranged two or more loudspeakers in the shape of a line.

[Claim 4] It is the sound-reproduction system characterized by making a surrounding loudspeaker incline, inputting the 1st signal into a center section or all loudspeakers, inputting the 2nd signal into the loudspeaker which is in a symmetric position to a loudspeaker train medial axis by the antiphase in the loudspeaker system which has arranged two or more loudspeakers in the shape of a line while arranging a loudspeaker so that it may become a convex ahead { loudspeaker system }, and driving the 1st and the 2nd signal simultaneously.

[Claim 5] A sound-reproduction system given in either of a claim 1 to the claims 4 characterized by having arranged the line-like loudspeaker, respectively so that it may become the vertical direction, having inputted L and the main signal of R channels as the first signal, and inputting a surround signal into the both sides of image screens, such as the Braun tube and a screen, as the second signal.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the sound system which reproduces two or more sound signals in the service area which became independent, respectively.

[0002]

[Description of the Prior Art] In order to realize sound field reproduction with presence, in addition to the stereo regeneration system which reproduces the signal of two channels by the loudspeaker system arranged at front right and left, a loudspeaker is arranged at a listening person's both sides or posterior part, and the system which reproduces the signal for surrounds from this loudspeaker is developed.

[0003] Hereafter, the conventional surround system is explained, referring to a drawing. (Drawing 6) shows the outline of a surround system. As for power amplifier, and 34-37, for the signal of a front right-and-left channel, ISL, and ISR, in (drawing 6), the surround signal of a back right-and-left channel, and 24-27 are [1L and 1R / a loudspeaker system and 5] listening persons.

[0004] The operation is explained about the surround system constituted as mentioned above. The sound signals 1L and 1R of a front right-and-left channel are amplified by power amplifier 24 and 25, are added to the loudspeaker systems 34 and 35 arranged ahead of a listening person, and are reproduced. Furthermore, surround signal 1SL of back right and left and 1SR are amplified by power amplifier 26 and 27, are added to the loudspeaker systems 36 and 37 arranged the side or behind the listening person 5, and are reproduced. Since the main signals 1L and 1R of a front right-and-left channel are reproduced by such surround system by the loudspeaker systems 34 and 35 arranged in front of the listening person 5, the image normal position transmits the atmosphere of reproduction sound field to the listening person 5, and surround signal 1SL and 1SR which are good and are reproduced by the back loudspeaker systems 36 and 37 offer the existing regeneration system a feeling of presence.

[0005] [Problem(s) to be Solved by the Invention] However, in order to realize a surround system with the above composition, the loudspeaker system for surrounds of a piece must surely be arranged at least the side or behind a listening person, and there is a fault that the loudspeaker for surrounds and the amplifier to drive must be connected. Therefore, it is in the situation that the surround system is seldom used, at a general home.

[0006] Obtaining presence equivalent to the conventional surround system in view of the above-mentioned trouble, this invention is only the loudspeaker system which reproduces the signal of a front right-and-left channel, and offers the sound-reproduction system which can reproduce simultaneously the surround signal which must be reproduced in the side or back.

[0007]

[Means for Solving the Problem] The sound-reproduction system of this invention is a system which arranges two or more loudspeakers in the shape of a line, and reproduces the 1st and the 2nd signal simultaneously, the 1st sound signal is in phase in the center section of the line array type loudspeaker, or all loudspeakers, and the 2nd sound signal is a system each other driven by the antiphase to the loudspeaker which is in a symmetric position to the medial axis of a loudspeaker train.

[0008]

[Function] Since the sound-reproduction system of this invention of the 1st signal is in phase and is driven, sound pressure is highly reproduced in the center of a line array loudspeaker system. Since the 2nd sound signal is driven by the right-and-left antiphase to the center, sound pressure is not produced on the medial axis of a loudspeaker train. The listening person who is near the center shaft top of a line array loudspeaker will hear only the 1st sound signal as a direct wave, and the direct wave of the 2nd sound signal will not reach a listening person. Therefore, a listening person will hear the 2nd sound signal component as a reflected sound from a wall, a floor, a ceiling, etc., and even if he does not do loudspeaker system arrangement in the side or back, he makes possible the system by which the effect of a good surround is acquired. By controlling the amplitude and phase of the 1st sound signal and the 2nd sound signal furthermore, mixing, and adding to each loudspeaker, the directional characteristics of each signal can be controlled and a more effective surround system can be obtained.

[0009]

[Example] Hereafter, it explains, referring to a drawing about one example of this invention. (Drawing 1) shows the sound-reproduction system in one example of this invention. In (drawing 1), 1a and 1b are the 1st and the 2nd sound signal. 1st sound signal 1a is amplified by power amplifier 21, and is added to the loudspeaker 31 of the center of a line array type loudspeaker system. 2nd sound signal 1b is separated spectrally into two, and one is in phase as it is, and it is amplified by power amplifier 22, and is added to a loudspeaker 32, and another signal is made into an antiphase, is amplified by power amplifier 23, and is added to a loudspeaker 33. Therefore, the loudspeakers 32 and 33 of a line array type loudspeaker system periphery serve as a system each other driven by the antiphase.

[0010] (Drawing 2) shows the directional characteristics in 500Hz when the 1st sound signal of the loudspeaker system shown in (drawing 1) is reproduced, and 1kHz. It becomes the property reproduced broadly so that clearly from this drawing. (Drawing 3) shows the directional characteristics in 500Hz when the 2nd sound signal of the loudspeaker system shown in this appearance at (drawing 1) is reproduced, and 1kHz. Since loudspeakers 32 and 33 are mutually driven by the antiphase, they serve as a dipole sound source, on a loudspeaker system transverse-plane shaft, directional characteristics are negated mutually and sound pressure does not produce them. And the zone where sound pressure is high will be made to the periphery of a loudspeaker system.

[0011] The way of being transmitted depending on which the sound reproduced from a loudspeaker when (drawing 4) inputs the front right-and-left channel signals 1L and 1R as the 1st sound signal and inputs two signals, surround signal 1SL of a back right-and-left channel and 1SR, into this loudspeaker system as the 2nd sound signal gets across to the listening person 5 is shown. The 1st sound signal 1L and 1R emitted from the loudspeaker system 3 is transmitted to the listening person 5 as direct wave 6D, and it reflects in walls 71 and 72, a floor 73, and a ceiling 74, and 2nd sound signal 1SL and 1SR are transmitted to the listening person 5 as reflected-sound 6R from the side or back. As mentioned above, since the listening person 5 does not listen to the 2nd sound signal as a direct sound from the loudspeaker system 3, the surround effect is acquired only by placing the loudspeaker system 3 ahead.

[0012] (Drawing 5) is the block diagram of other examples of this invention, and is a system reproduced only in the place in which controls the service area where the 1st sound signal is reproduced, and a listening person is. In (drawing 5), it is separated spectrally and 1st sound signal 1a is inputted into the mixing circuits 41, 42, and 43 by the non-inverter. 2nd sound signal 1b is also separated spectrally, and it is inputted into the mixing circuit 42 by the non-inverter, and is inputted into the mixing circuit 43 by the antiphase. The output of the mixing circuits 41, 42, and 43 is amplified by power amplifier 21, 22, and 23, respectively, and is applied to loudspeakers 31, 32, and 33. Although the directional characteristics to which the 2nd sound signal is emitted

from the loudspeaker system 3 become the same as the case where it is shown in (drawing 3), the directional characteristics emitted from the loudspeaker 3 of the 1st sound signal can be made sharp by controlling the amplitude of loudspeaker units 31, 32, and 33, and a phase. Consequently, the rate of the direct sound of the 1st sound signal which arrives at a listening person increases, the rate of the indirect sound which reflects at a wall, a floor, and the ceiling and arrives at a listening person can be lowered, and there is an advantage to which an image becomes clear more.

[0013] As mentioned above, although this example showed the system which used only three loudspeaker units, by controlling the amplitude and phase of each signal using two or more loudspeaker units also to the increase of the number of loudspeaker units, and the not only the 1st sound signal but 2nd sound signal, directional characteristics can be designed the optimal and the surround effect to a listening person can be heightened more. In addition, by carrying out weighting so that it may be large to the loudspeaker of a center section and may become small to the loudspeaker of a periphery about the input level of the 1st sound signal inputted into each loudspeaker, the directivity to the 1st sound signal becomes still sharper, and can heighten the surround effect to a listening person more. Moreover, the same effect is acquired even if it changes the efficiency of each loudspeaker instead of making weighting an input level. Furthermore, by making the radiation direction of the loudspeaker of the periphery of a line array type loudspeaker system incline so that it may become outside to the radial axis of the loudspeaker of a core, and arranging it, the directional characteristics of the 2nd sound signal can be controlled, the direct-sound level to a listening person can be lowered, and a better surround system can be realized.

[0014] The surround effect can be realized without arranging a rear loudspeaker the side and behind a listening person, if this loudspeaker system is arranged on both sides of image screens, such as the Braun tube and a screen.

[0015]

[Effect of the Invention] It becomes the system by which the main signal transmits a direct sound and a sub-signal mainly transmits only a reflected sound to a listening person, and even if it does not arrange a surround loudspeaker the side or behind a listening person, a surround system with presence can be made to attain by driving the loudspeaker system by which this invention was arranged in the shape of a line by the antiphase as mentioned above to the loudspeaker which is in phase as for the main signal, and a sub-signal has in a symmetric position focusing on a loudspeaker train.

[Translation done.]